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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Rubber Composition Having Blue-Tinted Grey Color

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Notice: The specification contained herein as filed

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RUBBER COMPOSITION HAVING BLUE-TINTED GREY COLOR

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This invention relates to a rubber composition having a blue-tinted grey color.

RUBBER COMPOSITION HAVING BLUE-TINTED GREY COLOR

Field

5 This invention relates to a rubber composition having a blue-tinted grey color.

Background

10 Rubber which contains carbon black reinforcement is often used for various rubber products. Some rubber products are prepared of other colors by using a colorant and reducing or deleting the carbon black. While various colors are often considered, many times the color is white.

15 For a white colored rubber, the rubber is typically compounded with a white-colored pigment such as, for example, titanium dioxide. Carbon black is not used for white colored rubbers because even very small amounts would discolor the white rubber.

20 It is appreciated that the titanium dioxide coloring pigment is not considered to be a rubber reinforcing ingredient for rubber but is more in a form of a filler.

25 In contrast, the typically unwanted carbon black is well recognized as being a reinforcing ingredient for rubber, and not usually just a filler pigment or material.

The inventor is not aware of a rubber composition having a grey color which is blue tinted.

30 Disclosure and Practice of the Invention

In accordance with this invention, a rubber composition is provided which is comprised of a sulfur cured rubber containing as basic colorants, based on 100 parts by weight rubber, about 40 to about 50 parts

by weight titanium dioxide pigment about 0.5 to about 1.0 part by weight carbon black wherein preferably, the said carbon black is characterized by having an iodine absorption number in the range of about 38 to about 48, and a dibutylphthalate value in the range of about 116 to about 126.

Such colorants are referred to as basic colorants since it is considered that the color of the rubber composition is derived primarily from such colorants and, thus, dominate its visible color, although it is recognized that it is likely that the rubber itself and other compounding ingredients contained in the rubber may contribute to its color in a minor way.

In further accordance with this invention, a rubber composition is provided having a blue tinted grey color characterized by having a RD axis value of about 20 to about 40, an (a) axis value of about zero to about -3 and a (b) axis value of about -3 to about -6.

Thus, in one aspect, a rubber composition is provided which is comprised of a sulfur cured rubber composition containing, as basic colorants, based on 100 parts by weight rubber; about 40 to about 50 parts by weight titanium dioxide pigment and about 0.5 to about 1.0 part by weight carbon black and where said rubber composition is further characterized by having a blue tinted grey color characterized by having a RD axis value of about 20 to about 40, an (a) axis value of about zero to about -3 and a (b) axis value of about -3 to about -6.

The color values are determined according to a Gardner XL Colorimeter with a tungsten-halogen lamp. For such measurements, it was calibrated to a white blank standard with an RD value of 85.1, an (a) value of -0.9 and a (b) value of +1.2.

It is important to appreciate that the color of the rubber composition, absent the included very small amount of carbon black, would typically be white.

5 By inclusion of the very small amount of carbon black, a rubber composition is provided which has a pleasing effect. It is also perceived that the added small, but appreciable, amount of carbon black contributes a very small amount of reinforcement to the white sidewall rubber which would not otherwise be  
10 present.

While the relatively light grey color imparted to the titanium dioxide pigment loaded rubber by the small amount of carbon black might be predictive, the blue tint of the grey color apparently imparted by specific  
15 carbon black(s) selection is not clearly understood. It is possible that the observed blue tint of the grey colored sidewall rubber is a result of one or more of the carbon black's specific surface area, or structure. Such carbon black characteristics are conventionally  
20 measured as (A) an iodine absorption number; ASTM Test No. D1510 and (B) a DBP (dibutylphthalate) value; ASTM Test No. D2414, respectively.

Preparation of a rubber composition with the observed blue tinted grey color was obtained with an  
25 FEF, oil-derived, N550 carbon black with an iodine absorption number (g/kg) specification of 43 +/- 5 and a DBP absorption number (cc/100g) specification of 121 +/- 5. Thus, it is perceived that a carbon black, namely an oil-derived carbon black, particularly of the  
30 FEF type having an iodine absorption number in the range of about 35 to about 50 and a DBP value in the range of about 115 to about 130 would be satisfactory for the preparation of a blue-tinted grey colored sulfur cured, titanium dioxide pigment loaded rubber  
35 composition.

The term FEF means it is a furnace carbon black, namely, fine, or fast, extrusion furnace black.

5 While it is acknowledged that the amount of carbon black used is only in a small amount of about 1 to about 2.5 weight percent of the titanium dioxide used in the white sidewall rubber, the presence of carbon black is considered of interest because of the rubber reinforcement quality of carbon black, even though such reinforcement effect would be very small due to the  
10 small amount of carbon black used, significantly a grey color imparted to the sidewall rubber would be expected to be of good stability because of the resistance of the carbon black to migrate within the cured rubber composition.

15 This is considered to be a particularly significant quality of the carbon black as a colorant.

It is, thus, considered significant that the blue tinted grey color are apparently primarily obtained with pigments instead of oil-based dyes, because the  
20 dyes would be expected to migrate to the rubber surface and diminish their colorant effect over time. Therefore, it is anticipated that the utilization of the reinforcement type of carbon black adds a degree of stability to the colorant effect for the sulfur cured  
25 rubber.

The color of the sulfur cured blue tinted grey rubber has been characterized by measurement with a Gardiner Colorimeter XL20 (1978 model) using a tungsten-halogen lamp. For the purposes of the  
30 description of the invention, such color determination may be referred to as a Gardner Color.

The color measurements are reported on a three axis basis and, thus, represent a three-dimensional projection of values.

The (a) and (b) axes can be represented on a flat plane with the RD axis being represented vertically through the said plane. All three axes join at their zero value.

5       The (a) axis represents a red-green axis with (+a) representing red and (-a) representing green.

The (b) axis, at right angles, or perpendicular, to the (a) axis, represents a blue-yellow axis with (+b) representing yellow and (-b) representing blue.

10       The RD axis, perpendicular to the plane of the (a) and (b) axis; represents a white-black scale where a zero value represents black and a +100 value represents white. The RD axis might sometimes be referred to as a grey scale.

15       Such color measurements and representations are well known to those having skill in the color characterization and color matching art.

20       Such rubber composition may be comprised of natural rubber, butyl rubber, halobutyl rubber, EPDM rubber, polybutadiene rubber, synthetic polyisoprene rubber and/or styrene/butadiene rubber. Preferably, the rubber is natural rubber or a blend of natural rubber with one or more of such other rubbers. For example, such rubber may be comprised of at least one rubber  
25       selected from natural rubber and halobutyl rubber may contain EPDM rubber and/or styrene/butadiene copolymer rubber.

30       As an example, such rubber composition may be comprised of a mixture of natural rubber and halobutyl rubber or a mixture of natural rubber, halobutyl rubber and EPDM rubber.

35       Preferably, the halobutyl rubber is selected from at least one of chlorobutyl rubber and bromobutyl rubber. EPDM rubber is an ethylene/propylene/non-conjugated diene terpolymer rubber.

The following example is intended to exemplify features of the invention. The parts and percentages are by weight unless otherwise indicated.

5

EXAMPLE I

10 Samples A and B were prepared and cured to which, for Sample A, titanium dioxide had been added and for Sample B, the titanium dioxide and a very small amount of carbon black had been added. Sample A is considered a Control and is referred to herein as Exp. A and Sample B, with the added carbon black, is referred to herein as Exp. B. Its composition comprised the ingredients shown in Table 1.



Table 1

| 5  | <u>Ingredients</u> <sup>1</sup>   | (Control)    |              |
|----|---|--------------|--------------|
|    |   | Parts        | Parts        |
|    |   | <u>Exp A</u> | <u>Exp B</u> |
|    | Chlorobutyl Rubber  | 20           | 20           |
|    | Natural Rubber  | 40           | 40           |
|    | EPDM Rubber <sup>2</sup>  | 20           | 20           |
| 10 | Styrene/Butadiene Rubber  | 20           | 20           |
|    | Titanium Dioxide  | 30           | 30           |
|    | Kaolin Clay   | 30           | 30           |
|    | Stearic Acid  | 1            | 1            |
|    | Microcrystalline Wax  | 1.5          | 1.5          |
| 15 | Benzothiazole Type  |              |              |
|    | Accelerator   | 0.75         | 0.75         |
|    | Disulfide Type  |              |              |
|    | Accelerator   | 1.25         | 1.25         |
|    | Sulfur  | 0.5          | 0.5          |
| 20 | Zinc Oxide  | 10           | 10           |
|    | Carbon Black (FEF, N550) <sup>3</sup>   | 0            | 0.7          |
|    | Ultra Marine Blue <sup>4</sup>  | 0.2          | 0.2          |
| 25 | 1. White tire sidewall rubber, derived from <u>Vanderbilt Rubber Handbook</u> (1978), page 651.                                   |              |              |
|    | 2. EPDM rubber, an ethylene/propylene/non-conjugated diene terpolymer rubber.   |              |              |
| 30 | 3. Obtainable from Cabot Corporation and reported as having an iodine absorption number of 43 +/- 5 and a DBP value of 121 +/- 5. |              |              |

4. Ultramarine blue Pigment identified as #5005 Ultramarine Blue (R5-5) and obtainable from Whittaker, Clark & Daniels, Inc.

5           The ultramarine blue pigment is often used in white colored rubbers and is used in both Exp. A and Exp. B rubbers. It is considered that it contributes only in a minor way, if at all, as a colorant, as compared to the titanium dioxide and carbon black.

10           In the practice of this invention, the ingredients, absent the carbon black, are first mixed together to form a white colored compounded rubber composition. Following such mixing step, the carbon black is then mixed with the rubber composition to form the blue  
15           tinted light grey colored compounded rubber.

          The Exp. A (Control) and Exp. B sulfur cured rubbers were measured for their color characteristics by a Gardner XL 20 Colorimeter. The colorimeter was a  
20           1978 model with a tungsten halogen lamp (new lamp in 1990) having a part No. 1T41B, catalog No. CG-5875. The colorimeter was turned on and warmed up for about 20-30 minutes and calibrated to a white standard (7900-202300).

          The following results were obtained as shown in  
25           Table 1.

Table 2

| Test<br>Object | <u>(RD) Axis</u> | <u>(a) Axis</u> | <u>(b) Axis</u> |
|----------------|------------------|-----------------|-----------------|
| 5 White        |                  |                 |                 |
| Standard       | 85.1             | -0.9            | +1.2            |
| Exp. A         | 67.7             | -1.7            | -0.7            |
| (Control)      |                  |                 |                 |
| 10 Exp. B      | 33.3             | -1.8            | -4.2            |

The Exp. A (Control) rubber was white in color.

The Exp. B cured rubber had a visibly light grey color with a definite blue tint.

15 Normally, absent the selection of the specified carbon black, it would have been expected that the Exp. B rubber composition would have simply exhibited a grey color without the substantial blue tint.

20 The test values shown in Table 1 confirm the visual inspection and show that there is a definite blue presence in the Exp. B rubber indicated by the (b) axis value of -4.2.

25 The test values reported in Table 1 show that the Exp. A rubber was white in color with very little (basically, insignificant) blue presence.

30 While various carbon blacks might be used in the practice of this invention for the rubber composition, preferably the carbon black is of the N550 type, which has an iodine absorption Number of 43 +/- 5 and a DBP value of 121 +/- 5 and is apparently the cause of the blue tint.

35 While the creation of the blue tint in the rubber composition might not be fully understood, it is considered that the blue tint was caused by the inclusion of the indicated FEF 550 carbon black.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in this art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

WHAT IS CLAIMED IS:

1. A rubber composition comprised of a sulfur  
cured rubber containing as basic colorants, based on  
5 100 parts by weight of said rubber, about 40 to about  
50 parts by weight titanium dioxide pigment and about  
0.5 to about 1 part by weight carbon black wherein said  
carbon black is characterized by having an iodine  
absorption number in the range of about 35 to about 50  
10 and a DBP value in the range of about 115 to about 130.

2. The rubber composition of claim 1 wherein the  
rubber is selected from at least one of natural rubber,  
or a blend of natural rubber and at least one of butyl  
15 rubber, halobutyl rubber, EPDM rubber, polybutadiene  
rubber, synthetic polyisoprene rubber and  
styrene/butadiene copolymer rubber.

3. The rubber composition of claim 1 where said  
20 carbon black is an FEF N550 carbon black.

4. A rubber composition comprised of a sulfur  
cured rubber containing as basic colorants, based on  
100 parts by weight of said rubber, about 40 to about  
25 50 parts by weight titanium dioxide pigment and about  
0.5 to about 1 part by weight carbon black wherein the  
color of said rubber composition is a color defined by  
having an RD value in a range of about 20 to about 40,  
an (a) axis value of about zero to about -3 and a (b)  
30 axis value of about -3 to about -6.

5. The rubber composition of claim 4 where said  
color description is a Gardner Color as determined by a  
Gardner XL20 instrument calibrated to a white blank

standard to an RD value of 85.1, an (a) value of -0.9 and a (b) value of +1.2.

5        6. The rubber composition of claim 4 wherein the rubber is selected from at least one of natural rubber, or a blend of natural rubber and at least one of butyl rubber, halobutyl rubber, EPDM rubber, polybutadiene rubber, synthetic polyisoprene rubber, and  
10        styrene/butadiene rubber.

10       7. The rubber composition of claim 4 where said carbon black is an FEF N550 carbon black.

15       8. The rubber composition of claim 4 where said carbon black is an oil-derived furnace black characterized by having an iodine absorption number in a range of bout 35 to about 50 and a DBP value in a range of about 115 to about 130.

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**SUBSTITUTE**

***REMPLACEMENT***

**SECTION is not Present**

***Cette Section est Absente***